EE/CSE 576: IMAGE UNDERSTANDING

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Purpose of Course: To introduce the topic of Computer Vision to graduate students. The course will discuss all three levels of computer vision: early processing, mid–level vision or feature extraction, and high–level vision or recognition. We will cover some basic material, but will emphasize state-of-the-art techniques and advanced applications.

Text: *Computer Vision*, by Linda Shapiro and George Stockman. Hot off the presses; you are the first class here to use the real thing. There are some errors that were either missed in our repeated proofing or actually introduced in the printing. George has an error handout on his textbook web page http://www.cse.msu.edu/~stockman/Book/book.html in both postscript and pdf. Probably most important are the permuting of the right sides of Figures 10.1, 10.4, and 10.5 in the color plates and the complete loss of the mesh in Figure 14.15, whose sole purpose was to show a mesh growing to fit the data.

Programming Language: We have put together a set of C programs for some important low-mid level operations that we often use in 3D object recognition. These will available for downloading from the course web. Students should be able to write their own C/C++ programs to add additional capabilities as needed.

Project: Each student will propose, design, and implement a program that does some kind of machine vision. Possible topics will be discussed in class. The project is geared to take 4-5 weeks and requires a 5-10 page report describing the program and the results.

Topics to Cover:

The topics I expect to cover, grouped into the appropriate chapters in the book, are given below. We will not cover every topic in every chapter, but everything written is listed to give you the whole picture.

1. Basics

   - Ch1. Introduction
   - Ch2. Imaging and Image Representation
   - Ch3. Binary Image Analysis
   - Ch4. Pattern Recognition Concepts*

2. Features for Recognition

   - Ch5. Filtering and Enhancing Images (just for edge-finding!)
   - Ch6. Color
   - Ch7. Texture
   - Ch8. Content-Based Image Retrieval*
   - Ch9. Motion
   - Ch10. Image Segmentation*

3. Recognition and Matching

   - Ch11. Matching in 2D*
   - Ch12. Perceiving 3D from 2D Images*
   - Ch13. 3D Sensing*
   - Ch14. 3D Models and Matching*

4. Applications

   - Ch15. Virtual Reality*
   - Ch16. Case Studies

Evaluation: The grades will be based on a combination of small homework sets, midterm, final, and project. Projects will be due on the last day of class, so I have ample time to grade them.

* Research areas in which my students and I work.